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Environmental benefits of China's entertainment and media market: implications for sustainability

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ABSTRACT

The fundamental role of entertainment and media in the field of environment cannot be denied in this digitalised world. The world faces various environmental issues, and people need to spread awareness about these diseases and precautionary measures. Entertainment and media play a crucial role in spreading information among the masses. The strength of entertainment and media can significantly influence environmental sustainability. Very limited studies have explored this dimension. Hence, our research is covering this vacuum by investigating the role of entertainment and media on the environment in the case of China by using the data from 1998 to 2020. The study explores this nexus by employing the ARDL approach that reports that entertainment and media are significant determinants of environmental quality both in the long-run and short-run. Thus, it is suggested that policymakers need to formulate policies that ensure inclusive usage of entertainment and media in society.

1. Introduction

Since the Chinese economy's opening up, people's health in China has been amended, accompanied by social and economic development (Yang & Liu, 2018). Few studies tried to explore the combined effect of social and economic development on human health and argued that exploring social and economic indicators' impact on human health is crucial to improving understanding and knowledge about public health (Karim et al., 2022). Our study further explores the impact of the social indicators on human health, specifically, the impact of the entertainment and media market on health (T.-T. Sun et al., 2021). Entertainment and media have become an important issue nowadays as it plays a fundamental role in promoting society's social and economic development (Wei & Ullah, 2022). One such social and economic development by media and entertainment is the field of health and healthcare (Palvia et al., 2018). Due to the progress in the field of healthcare and health, the death ratio has declined significantly (Bansal & Kumar, 2021). Media plays a fundamental role in promoting

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knowledge and information about environmental quality (Dorfleitner & Grebler, 2022). The health issues and diseases prevailing worldwide are engrossed by media and presented worldwide (Li et al., 2020). The existing theoretical literature discloses mixed findings. One strand of literature reports the positive impact of media and entertainment on environmental sustainability, while the other strand of literature highlights the negative aspects of media and entertainment (Malmodin & Lundén, 2016; Saraf & Balamurugan, 2018). This topic has been chosen due to the increasing need for media and entertainment in the environment field.

Studies argue that media and entertainment can convert the negative behaviour of individuals into positive behaviour about environmental issues (Mirza et al., 2020). Media can terminate the negative thinking of individuals about health-related issues and produce awareness and knowledge about environmental concerns and solutions (Malmodin et al., 2013; Rauterberg, 2004). (Elizabeth & Aransi, 2020) reveal that media positively influence almost 70% of the population's health and environment. The study further argued that healthcare service providers get involved in a partnership with media to present healthcare and health issues in front of people via various media sources (Berger, 2022). Raising such environmental concerns and issues through media sources helps the common man to raise their environmental issues through media (Shao et al., 2022). Furthermore, new advancements and ideas in the health field can be disclosed through the media channel (Mirza et al., 2020). The literature argues that people prefer to adopt media as a source of entertainment for getting mental peace and satisfaction (Su et al., 2022). Music, movie, TV, VOD, VCR, game console, computer games, the internet, etc., are various sources through which people try to get entertainment for mental peace and satisfaction (Do & Kincaid, 2006; Usman et al., 2021). Thus, the role of media and entertainment cannot be denied in the field of the environment (Kurland & Zell, 2010).

The media industry plays a fundamental role in spreading information among people regarding health issues that emerged due to environmental pollution and enhancing awareness about environmental quality. In literature, few studies have tried to dig out this nexus for other economies of the world. For instance, (Zhou et al., 2021) explored the contribution of media in spreading environmental issues. Later on, (Q. Li et al., 2021) denoted that media attention is a predictor of environmental pollution and is more important than environmental policies. (Selvaranjan et al., 2021) added that media reports mostly affect environmental issues. (Fahy et al., 2023) reported that media reporting can effectively promote public awareness about environmental issues. (Usman et al., 2021) reported that the news media can play a significant role in protecting the environment, and Mohajan concluded that social media could help monitor the environment.

Few studies have reported that media advertisement positively affects people's environmentally friendly behaviour (Saraf & Balamurugan, 2018). For instance, scenes of drugs, alcohol consumption, smoking, and tobacco use in movies and advertisements negatively influence the behaviour of audiences. This tends to modify the addiction and behaviour of people to such detrimental substances, as psychologists report that the motivational power of negative advertisements is stronger than positive advertisements (Rogers et al., 2021). Studies argue that media and entertainment

positively influence the behaviour of teenagers. The positive actions and scenes in advertisements positively influence teenagers and have favourable effects on the environment (He & Liu, 2018). Due to media and entertainment, people are exposed to substance abuse, violence, and sexual indications. Children mostly become addicted to media and entertainment and become inactive. Hence, their health and environment deteriorate. Media and entertainment change people's behaviour to psychological changes due to excess use of media positively influencing the environment of people. Thus, entertainment and media increase the environmentally friendly behaviour of people.

In 2021, the total revenue generated by China's media and entertainment industry will be around 358.6 billion US$. It is expected that the revenue will reach 436.8 billion US$in 2021, with a 5.1% annual growth rate that is higher than the worldwide growth rate of 4.6% (Z. Li et al., 2021) China has developed as an undeniable worldwide economic power (M. Sun et al., 2021; Taghizadeh-Hesary & Yoshino, 2020). China's media and entertainment industry are growing faster than the rest of the world. China's media and entertainment industry have amplified significantly due to changes in the environment, ecological improvement, environmental regulator systems, variations in the social environment, and technological changes. China is among the world's largest carbon emitters (Umar et al., 2022; Wang et al., 2021). China has signed the Paris Climate agreement, in which China is bound to reduce the level of CO_2 emissions up to 60% to 65% by 2030 (Ji et al., 2021; Umar et al., 2021). Due to this agreement, understanding the mechanism behind reducing the level of CO_2 emissions is important to fulfil this goal.

From the above discussion, it is concluded that media and entertainment have direct connections with environmental sustainability, and the fundamental importance of media and entertainment cannot be denied in the environment. However, the existing stock of literature provides inconclusive findings. Furthermore, very limited studies have explored this nexus empirically. This study identifies several shortcomings in the prevalent literature and attempts to fill these vacuums. Firstly, the existing studies on environmental sustainability consider ICT impact but do not consider entertainment and media in analysis (Yahyaoui et al., 2022). However, entertainment and media is an imperative determinant that describes the process of environmental sustainability in China. Another vacuum is that none of the earlier studies have examined the effect of the media & entertainment market on CO_2 emissions and GHGs emissions.

Thus, our study is fulfilling this deficiency by exploring the impact of entertainment and media on the environment in the case of China. Our study makes a contribution to the existing literature in the following ways. For the first time, our study explores the association between media & entertainment and environmental sustainability in China. To the best of the authors' awareness, no previous study has investigated environmental sustainability by considering the role of the media & entertainment market in China. Lastly, this study provides short-run and long-run dynamics for environmental sustainability by using the ARDL approach. This research will be beneficial for prioritising investment in the media and entertainment industry for environmental betterment. The study will also help design more appropriate and relevant policies for the digital sector to promote environmental sustainability positively.

2. Model and method

Following the standard empirical studies (Do & Kincaid, 2006; Lau et al., 2012; Saraf & Balamurugan, 2018), we have constructed model (1) to examine the relationship between entertainment and media market and environmental sustainability in China.

$$CO_{2,t} = \varphi_0 + \varphi_1 EMM_t + \varphi_2 Internet_t + \varphi_3 GDP_t + \varphi_4 FD_t + \varepsilon_t \qquad (1)$$

where the CO2 emissions (CO2) are a function of the entertainment and media market (EMM), internet users (Internet), GDP per capita (GDP), financial development (FD), and random-error term (ε_{it}). Since increased China's entertainment and media market leads to environmentally friendly behaviour of people, we expect estimates of φ_1 to be negative. However, the internet, economic development, and financial development are influencing factors of environmental sustainability; thus, estimates of φ_2, φ_3, φ_3 in Equation (1) could be negative. The coefficient discussed above is long-term estimates. The next stage is to describe Equation (1) in an error-correction format thus that we can also estimate the short-term results effects.

$$\Delta CO_{2,t} = \omega_0 + \sum_{k=1}^{n} \beta_{1k} \Delta CO_{2,t-k} + \sum_{k=0}^{n} \beta_{2k} \Delta EMM_{t-k} + \sum_{k=0}^{n} \beta_{3k} \Delta Internet_{t-k}$$
$$+ \sum_{k=0}^{n} \beta_{4k} \Delta GDP_{t-k} + \sum_{k=0}^{n} \beta_{5k} \Delta FD_{t-k} + \omega_1 CO_{2,t-1} + \omega_2 EMM_{t-1}$$
$$+ \omega_3 Internet_{t-1} + \omega_4 GDP_{t-1} + \omega_5 FD_{t-1} + \varepsilon_t \qquad (2)$$

In basic Equation (1), the coefficients assigned to the first-differenced terms are short-term effects, and the long-term estimates are measured through $\omega_2 - \omega_6$ normalised on ω_1. (Pesaran et al., 2001) suggest two tests for establishing cointegration among the concern variables such that the long-term estimates are valid. One is the F-test, and the other one is known as the t-test, which establishes the significance of the error correction term (λ). Both tests have used their own tabulate new critical values that also account for the degree of integration of the concern variables. Various time series cointegration methods have been useful to test the existence of cointegration between the concern variables in several studies. These econometric methods, such as; those (Engle & Granger, 1987; Johansen & Juselius, 2009), have the necessary conditions that all the series should be integrated in a similar order of integration. The ARDL method is more suitable than other outdated cointegration methods (Bahmani-Oskooee et al., 2020; Sohail et al., 2021). This method is more appropriate once macro variables are found to be stationary at I(0) or I(1) or I(0)/I(1). This approach provides consistent estimates for small sample data, as in the case of China (Li et al., 2022). This method considers long-run as well as short-run parameters and estimates simultaneously. The ARDL method also deals with the endogeneity issues of variables in the regression analysis (Lei et al., 2021; Usman et al., 2021). ARDL is a workhorse approach and is extensively used in applied economies. Lastly, we have also used some diagnostics tests. To test for serial correlation, Heteroscedasticity, and correct model specification, we have used Lagrange multiplier (LM), Breusch Pagan

(BP), and Ramsey's RESET tests for this purpose. The stability of coefficient estimates is tested by employing the CUSUM and CUSUM-sq tests.

3. Data

Our study examines the impact of entertainment and media on the CO_2 emissions of Chinese people over the time span from 1998 to 2020. Table 1 contains information about variables definitions and sources of data. Descriptive statistics of each variable are reported in Table 2. Literature reveals that CO_2 emissions are a fundamental indicator to measure the environmental quality of any economy; hence, we are using this indicator to measure environmental quality in our study. The study is also measuring the environmental quality through greenhouse gas emissions. Entertainment and media role is determined through entertainment and media market in billion US$. Besides these variables, our study is also considering the role of internet users (measured as a percent of the population), GDP per capita (measured in constant 2015 US$), and financial development (domestic credit to the private sector as a percent of GDP) as control variables. The required data for this study has been collected from the World Bank, UNDP, and the national bureau of statistics. The mean of CO_2, GHGs, EMM, internet, GDP, and FD are 6.834 kt, 6.930 kt, 2.151US$, 2.674%, 8.475 US$, and 4.849, respectively, while the standard deviation are 0.196 kt, 0.173 kt, 0.250 US$, 1.611%, 0.562 US$, 0.166, respectively.

4. Results and discussion

Our study is based on time-series data. Thus, checking the unit root properties of the data series is mandatory before employing the ARDL regression technique. For performing this task, our study uses PP and DF-GLS methods, and the obtained results are presented in Table 3. The results of the PP test report that CO_2 and internet are found stationary at level, while GHGs, EMM, GDP, and FD are found to be the first

Table 1. Definitions and data sources.

Variables	Symbols	Definitions
CO2 emissions	CO2	CO2 emissions (kt)
Greenhouse gas emissions	GHGs	Total greenhouse gas emissions (kt of CO2 equivalent)
Entertainment and media market	EMM	Entertainment and media market (billion U.S. dollars)
Internet users	Internet	Individuals using the Internet (% of the population)
GDP per capita	GDP	GDP per capita (constant 2015 US$)
Financial development	FD	Domestic credit to the private sector (% of GDP)

Source: World Bank and National Bureau of Statistics.

Table 2. Descriptive statistics.

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
CO2	6.834	6.887	7.083	6.498	0.196	−0.554	1.847
GHGs	6.930	6.972	7.156	6.644	0.173	−0.479	1.770
EMM	2.151	2.158	2.550	1.683	0.250	−0.069	2.121
Internet	2.674	3.364	4.254	−1.781	1.611	−1.222	3.792
GDP	8.475	8.543	9.247	7.555	0.562	−0.205	1.667
FD	4.849	4.824	5.206	4.625	0.166	0.555	2.183

Source: Author's estimation.

Table 3. Unit root testing.

	PP			DF-GLS		
	I(0)	I(1)		I(0)	I(1)	
CO2	−1.265**	−2.778*	I(0)	−1.230	−2.231**	I(0)
GHGs	−1.214	−2.658*	I(1)	−1.089	−2.321**	I(1)
EMM	−1.754	−2.875*	I(1)	−1.201	−2.102**	I(1)
INTERNET	−7.023***		I(0)	0.954	−1.654*	I(1)
GDP	−2.012	−2.825*	I(1)	−2.102**		I(0)
FD	0.854	−3.547**	I(1)	0.288	−3.658***	I(1)

Note: *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.
Source: Author's estimation.

Table 4. ARDL estimates of CO2 emissions and Greenhouse gas emissions.

	CO2				GHGs			
Variable	Coefficient	S.E	t-Stat	Prob.*	Coefficient	S.E	t-Stat	Prob.*
Short-run								
EMM	−0.639*	0.357	−1.791	0.117	−0.603*	0.338	−1.782	0.118
EMM(-1)	0.285	0.285	1.001	0.350	0.263	0.287	0.918	0.389
EMM(-2)	0.838***	0.269	3.119	0.017	0.768***	0.255	3.010	0.020
INTERNET	0.111*	0.062	1.799	0.115	0.086*	0.050	1.720	0.119
INTERNET(-1)	0.100**	0.043	2.304	0.055	0.078*	0.040	1.924	0.096
INTERNET(-2)	−0.096***	0.031	−3.088	0.018	−0.075**	0.029	−2.571	0.037
GDP	0.488	0.370	1.320	0.228	0.380	0.347	1.093	0.311
GDP(-1)	2.142***	0.665	3.220	0.015	1.727***	0.635	2.722	0.030
GDP(-2)	1.170**	0.593	1.974	0.089	0.951*	0.556	1.710	0.131
FD	−0.104	0.104	−1.007	0.347	−0.100	0.097	−1.024	0.340
FD(-1)	0.138**	0.069	1.996	0.086	0.111*	0.065	1.716	0.130
FD(-2)	0.133	0.083	1.589	0.156	0.093	0.078	1.192	0.272
Long-run								
EMM	−0.233***	0.087	−2.666	0.026	−0.250***	0.058	−4.307	0.002
INTERNET	−0.375**	0.162	−2.322	0.045	−0.290*	0.172	−1.689	0.126
GDP	0.423***	0.073	5.785	0.000	0.412***	0.047	8.706	0.000
FD	0.911***	0.231	3.944	0.003	0.866***	0.216	4.013	0.003
C	4.028***	0.416	9.678	0.000	4.161***	0.283	14.63	0.000
Diagnostics								
F-test	11.20***				12.02***			
ECM(-1)*	−0.194***	0.042	4.669	0.019	−0.479***	0.061	7.860	0.016
LM	1.203				1.032			
BP	0.387				0.654			
RESET	0.601				0.140			

Note: *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.
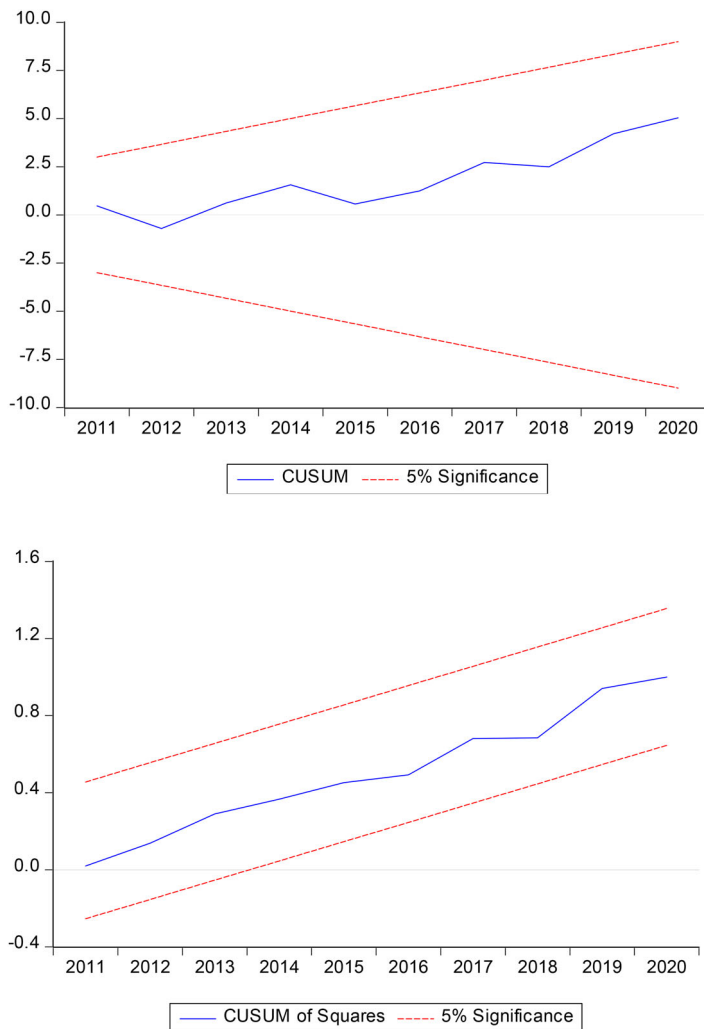Source: Author's estimation.

difference stationary series. The results of the DF-GLS test report that CO2 and GDP are stationary at a level, while GHGs, EMM, internet, and FD are found to be the first difference stationary series. After confirming the unit root characteristics of the data series, the ARDL approach has been applied to find the long-run and short-run associations among variables. The study has regressed two separate models examining the impact of media and entertainment on health and quality of life in China. Table 4 presents the long-run and short-run findings of both models.

In the long-run, impact of entertainment and media on CO2 emissions and greenhouse gas emissions is negative and significant. These results infer that entertainment and media significantly improve the environmental quality in China in the long run. It is reported that a 1 percent increase in entertainment and media tends to mitigate carbon emissions by 0.233 percent and GHGs by 0.250 percent in the long-run.

Finding infers that entertainment and mass media are significant determinants of environmental performance. The entertainment and mass media change people's negative behaviour into positive behaviour regarding environmental issues. Similarly, the finding is also reported by (He & Liu, 2018) and (Shao et al., 2022). This also means that new ideas and advancements regarding the environment can be exposed through the entertainment and mass media, improving environmental quality. Findings also infer that environmental performance is easily promoted electronically and via communication. Entertainment and mass media have played a vital role in recent climatic and technological advancements. Thus, China's entertainment and media market provides high value to environmental issues.

As described earlier, the role of internet users, GDP per capita, and financial development have been incorporated as control variables. The findings infer that the internet impact on CO_2 emissions and GHGs are significant and negative, confirming
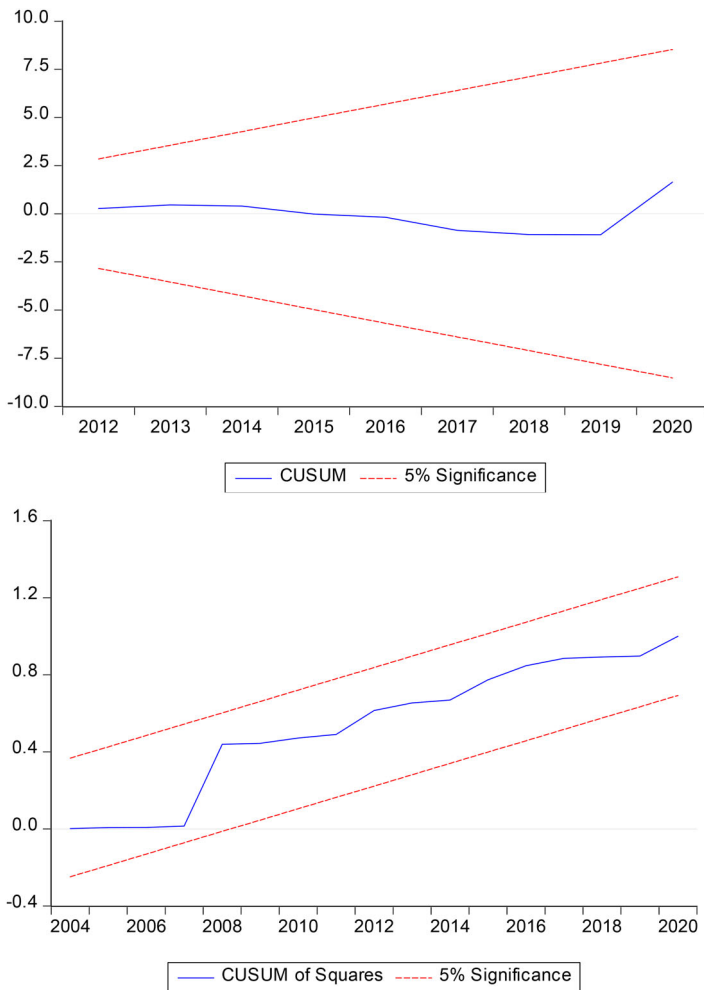

Figure 1. Plot of CUSUM and CUSUM-sq (CO2 model).
Source: Author's estimation.

that the internet plays a positive role in improving environmental quality in China in the long run. It reports that a 1 percent increase in internet use results in reducing CO2 emissions by 0.375 percent and GHGs by 0.290 percent, respectively. This finding is in line with (Dutta et al., 2019) and (Kouton et al., 2021), who noted that internet development improves environmental quality in Asian and African nations. This means that internet development has the capacity to contribute to environmental issues by improving economic development, reducing poverty, and enhancing knowledge regarding the environment. Finding also infers that the internet facilitates delivery of services, management and efficiency of government, and environmental literacy, which in turn improves the quality of the environment.

The impact of GDP per capita on CO2 and GHGs emissions is positive and significant. It infers that an increase in GDP per capita tends to deteriorate the quality of the environment in China in the long-run. It displays that a 1 percent escalation in GDP per capita tends to enhance CO2 emissions by 0.423 percent and GHGs by 0.412

Figure 2. Plot of CUSUM and CUSUM-sq (GHGs model).
Source: Author's estimation.

percent in the long-run. Economic development leads to an increase in the use of energy and robustly affects environmental quality. Similarly, the finding is also reported by (Lu et al., 2017) and (Mujtaba & Shahzad, 2021) for China and OECD nations. This also suggests that economic development increases income levels and technological progress, which results in the deterioration of the environmental quality level in China. Similarly, the impact of financial development is positive and significant on CO_2 emissions and GHGs emissions, revealing that financial development also results in long-term deterioration of environmental health in China. It is reported that a 1 percent upsurge in financial development increases CO_2 emissions by 0.911 percent and GHGs by 0.866 percent in the long-run. Hence, it is concluded that entertainment and media, internet use, GDP per capita, and financial development are fundamental determinants of China's environment in the long run. This finding is backed by (Shahbaz et al., 2019), who noted that financial development deteriorates environmental performance via numerous transmission channels such as income, education, and infrastructure.

In the short-run, entertainment and media are found to report a significant and negative impact on CO_2 emissions and GHGs in the case of China. However, internet use significantly and positively impacts CO_2 emissions and GHGs in the short-run. The nexus between GDP and environmental quality is found insignificant in the short-run. Similarly, financial development reports an insignificant association between CO_2 emissions and GHGs in China's short-run case. The lower panel of Table 4 represents the results of important diagnostics tests such as F-stat, ECM, LM test, Ramsey RESET test, and the stability test. The F-stat and ECM test both validate the existence of long-run cointegration relationships among selected variables of models. LM test confirms that there is no issue of autocorrelation. The stability of models is confirmed by findings of CUSUM and CUSUM-sq tests in Figures 1 and 2. In Table 5, the results of the causality test for China show that bidirectional causality

Table 5. Results of causality tests.

Null hypothesis:	F-Stat	Prob.	Null hypothesis:	F-Stat	Prob.
EMM → CO2	2.749*	0.094	EMM → GHGS	3.578*	0.052
CO2 → EMM	4.821**	0.023	GHGS → EMM	5.698**	0.014
INTERNET → CO2	1.900	0.182	INTERNET → GHGS	2.033	0.163
CO2 → INTERNET	3.109*	0.072	GHGS → INTERNET	2.337	0.129
GDP → CO2	0.896	0.428	GDP → GHGS	1.306	0.298
CO2 → GDP	0.676	0.523	GHGS → GDP	0.478	0.629
FD → CO2	0.590	0.566	FD → GHGS	0.397	0.679
CO2 → FD	2.220	0.141	GHGS → FD	2.180	0.145
INTERNET → EMM	3.241**	0.066	INTERNET → EMM	3.241*	0.066
EMM → INTERNET	0.585	0.568	EMM → INTERNET	0.585	0.568
GDP → EMM	3.977**	0.040	GDP → EMM	3.977**	0.040
EMM → GDP	0.042	0.959	EMM → GDP	0.042	0.959
FD → EMM	0.032	0.969	FD → EMM	0.032	0.969
EMM → FD	1.517	0.249	EMM → FD	1.517	0.249
GDP → INTERNET	3.791**	0.045	GDP → INTERNET	3.791**	0.045
INTERNET → GDP	2.076	0.158	INTERNET → GDP	2.076	0.158
FD → INTERNET	0.597	0.562	FD → INTERNET	0.597	0.562
INTERNET → FD	1.726	0.210	INTERNET → FD	1.726	0.210
FD → GDP	0.127	0.882	FD → GDP	0.127	0.882
GDP → FD	14.94***	0.000	GDP → FD	14.94***	0.000

Note: *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.
Source: Author's estimation.

exists between EMM and CO2 emissions, while bidirectional causality also exists from EMM to GHGS.

5. Conclusion and policy recommendations

Entertainment and media are beneficial tools that can be used to promote environmental awareness in society. Entertainment and media provide easy services to spread knowledge and information about environment-related issues. The impact of entertainment and media on the environment has not been explored in the case of China. Thus, our research aims to examine the role of entertainment and media in determining environmental performance in the case of China. Our study explored this nexus with the help of the ARDL approach and reported these findings. Our study reports that entertainment and media significantly improve environmental quality in the long and short-run. Additionally, internet use reports significant improvement in the quality of the environment in the long and short-run. Besides these, it is reported that financial development and GDP per capita are significant determinants of environmental quality.

Based on obtained results, the study develops the following policy recommendations. The entertainment and media industry can have a significantly positive effect on eco-friendly consumption and lifestyles. The residents are usually not well aware of pollution hazards, climatic challenges, and pollution control or prevention technologies due to lack of awareness. Thus, there is a need to encourage the media and entertainment industry to spread better guidance about lifestyle and behavioural changes. To explore the media and entertainment industry, schools, research institutes, enterprises, NGOs, and residents need to coordinate with each other to reduce environmental pollution. These policy recommendations can support designers and developers in the entertainment and media industry. The awareness and knowledge about environmental issues such as the use of energy, automobiles, electronic goods, etc., can be endorsed through entertainment and media that help people be aware of environmental technology's use in such a manner that maintains the quality of the environment. Foreign investors should increase investment in the entertainment and media industry. Our study reports a negative nexus between financial development and environmental performance; hence, it is recommended that the proportion of financial development should be determined to enhance the environment's quality. The Chinese government must play a crucial role in solving the policy-related barriers to the entertainment and media industry. It is found that internet use and environment are positively associated. Hence, policymakers and government should strengthen the ICT sector more.

This study also contains some limitations. For example, the role of CO2 emissions and GHGs are considered to measure environmental performance, while the impact of other environmental measures is completely ignored. In future studies, other determinants of the environment should be incorporated that take into account the quality perspective of the environment. Our study only considers the Chinese economy; future studies should extend this analysis by considering other nations.

Disclosure statement

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